SYSTEM FOR MONITORING PRODUCTION OF PREFILLED SYRINGES

SPECIFICATION

FIELD OF THE INVENTION

The present invention relates to the production of hypodermic syringes. More particularly this invention concerns the production of prefilled ready-to-use syringes.

BACKGROUND OF THE INVENTION

A prefilled syringe is normally made by first sterilizing and drying the open syringe body. Then it is filled with the required medicament and capped. At the end of the process the filled and capped syringe is packaged.

The syringes are normally labeled so that the user can determine that he or she has the right product. Clearly it is critical that the contents match the label, as otherwise serious accidents could occur. In fact the label typically not only identifies the medicament and dose size, but also the production date and the expiration date. Other information such as price, producer's code, and batch number can also be printed on the syringe or on a label attached to it.

The labeling serves primarily for the user to determine that the right medicament is being or has been administ red. It

is often difficult or impossible to read and serves little function during the actual production of the syringe.

SUMMARY OF THE INVENTION

Prefilled syringes are made according to the invention by displacing a succession of syringes along a conveyor path from a supply station successively through a marking station, a filling station, and to a downstream packing station. Each of the syringes is filled with a predetermined dose of a medicament in the filling station. The syringes are marked in the marking station with machine-readable data identifying the medicament to be put in the empty syringe at the filling station. The syringes are scanned downstream of the marking station and any syringe whose data is not readable is then removed from the conveyor path, as is any syringe whose data does not correspond to the medicament filled into the syringe at the filling station.

Thus according to the invention this data is provided before the syringes are filled. It may be applied even before they are cleaned and sterilized, or after this step. Either way the production equipment gains according to the instant invention the ability to check all along the production path whether the right medicament is going into the right syringe. Going further, it is possible to use a machine scan to ensure that the right syringes are being us d for each patient, and even to confirm after administration whether th right syringe was used.

The machine-readable data marked on the syringes is redundant, that is it can be applied in standard written-out form readable by the user, and in an encoded format, for instance a bar code, particularly readable by a scanner. Two versions of the data can be printed on the syringe so that minor cosmetic damage to the syringe will not make it unreadable, something that is particularly important to prevent waste of valuable medical supplies. The markings can be encoded by the Data Matrix ECC 200 standard.

In accordance with the invention the syringes are marked before any production steps, that is as they are pulled from the supply of empty syringes. Thus the cleaning/filling/packaging machinery can monitor the syringes through the entire production process. Thus according to the invention the syringes are scanned at several locations along the path.

The markings applied to the syringes can be put in an ink that is not readable under normal light. Thus the scanner can employ ultraviolet or black light to read the markings. Normally they are printed on the syringes, although it is within the scope of the invention for the markings to be laser-inscribed on the syringes, a procedure ensuring that they will remain readable under the worst of conditions.

In according to with the invention the syringes are rotated about their ax s during scanning of the markings. This scanning can be done from two locations offset angularly with

resp ct to the axis of th syringe is scanned and the syringes are rotated at an angular speed coordinated with a frame rate of a scanning device effecting the scanning. This ensures that even if the syringes have gotten turned around on the conveyor, they will be read and will not be unnecessarily culled out.

BRIEF DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a schematic diagram illustrating the method of this invention; and

FIG. 2 is a view of a detail of a machine for carrying out the method.

SPECIFIC DESCRIPTION

As seen in FIG. 1 a succession of syringes 1 come from a supply and pass on a conveyor path through a marking station M where they are printed or laser-inscribed with markings M of data regarding the composition of the medicament to be filled later into them, the production date, the expiration date, the dosage, and the like. The information is written out and encoded, and some information may be marked in ink only readable under UV light.

Then the syringes 1 move on the path P through a scanning station S1 where any syringes 1 whose markings cannot be read are culled out. They are then filled in a filling station F, and then scanned again in a station S2 to make sure that the indicia on the syringes 1 corresponds to what was just filled into them in the station F. The syring s 1 are then put in boxes

in a packing station P and the packed syringes 1 are scanned again in a station S3 to ensure that what is packed corresponds to what is supposed to be in the box. Finally they are supplied to a user. Further scanning at the end-user location can be used to confirm that what is being administered and what has been administered is the right medicament.

Of course it is possible to have a cleaning station upstream of the first marking station M and a capping station between the filling station F and packing station P. What is critical is that the indicia or markings M be applied early in the production cycle and used to match the syringes with the products they are to be filled with and the packages they are to be packed into.

FIG. 2 shows the syringes carried on a carousel or turntable-type conveyor 4 for movement along an arcuate path P. The syringes 1 are in holders 5 that can rotate them about their upright center axes as they pass a pair of optical scanners 2 that are angularly offset from each other. The rotation of the syringes 1 is synchronized with the frame rate of the scanners 2 so that at least one of the two scanners 2 will be certain to get a good read of the markings M as they pass. Any syringes 1 found to be unreadable or to have markings M that do not correspond with what a central controller knows they are supposed to hold are culled out by an extracting device 3.